UltraTech
Group of Labs

FCC TCB & IC CB

Ultratech's Accreditations:

0685

FCC
91038

1309

Industry Canada
Industrie Canada
Approved Test Facility
46390-2049

NvLap Lab Code 200093-0

SL2-IN-E-1119R

Korea KCC-RRL
CA2049

3000 Bristol Circle,
Oakville, Ontario,
Canada L6H 6G4

Tel.: (905) 829-1570
Fax.: (905) 829-8050

Website: www.ultratech-labs.com
Email: vic@ultratech-labs.com

July 14, 2010

Federal Communication Commission
7435 Oakland Mills Road
Columbia, MD 21046
USA

Subject: **Certification Application under FCC CFR 47, Parts 2 and 25 (Subpart C) - 1.6 GHz Mobile-Satellite Service**

Applicant: **GeoPro LBS Inc.**
Product: **GeoPro Messenger**
Model: **GPM-1000**
FCC ID: **X7BGPM1000**

Dear Sir/Madam,

As appointed agent for GeoPro LBS Inc., we would like to submit the application for certification of the above product. Please review all required documents uploaded to your E-Filing web site.

If you have any queries, please do not hesitate to contact us.

Yours truly,

Tri Minh Luu, P. Eng.,
V.P., Engineering

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Email: vic@ultratech-labs.com

July 14, 2010

GeoPro LBS Inc.
755 Queensway, Suite 200
Mississauga, Ontario
Canada, L4Y 4C5

Attn.: **Mr. Jeff Wilson**

Subject: **Certification Application under FCC CFR 47, Parts 2 and 25 (Subpart C) - 1.6 GHz Mobile-Satellite Service**

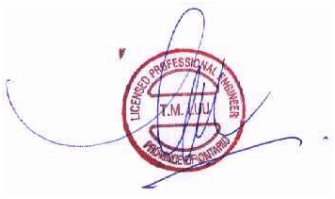
Product: **GeoPro Messenger**
Model: **GPM-1000**
FCC ID: **X7BGPM1000**

Dear Mr. Fawzy,

The product sample has been tested in accordance with **FCC CFR 47, Parts 2 and 25 (Subpart C) - 1.6 GHz Mobile-Satellite Service,** and the results and observation were recorded in the engineering report, Our File No.: RPST-001FCC25 & 9601_TestReport_FCC25.

Enclosed you will find copy of the engineering report. If you have any queries, please do not hesitate to contact us.

Yours truly,



Tri Minh Luu, P.Eng
Vice President - Engineering

ENGINEERING TEST REPORT

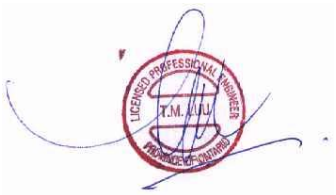
GeoPro Messenger
Model No.: GPM-1000
FCC ID: X7BGPM1000

Applicant: **GeoPro LBS Inc.**
755 Queensway, Suite 200
Mississauga, Ontario
Canada, L4Y 4C5

Tested in Accordance With

Federal Communications Commission (FCC)
CFR 47, PARTS 2 and 25 (Subpart C)
1.6 GHz Mobile-Satellite Service

UltraTech's File No.: RCI-001FCC25

This Test report is Issued under the Authority of Tri M. Luu, Professional Engineer, Vice President of Engineering UltraTech Group of Labs Date: July 14, 2010	
Report Prepared by: Dharmajit Solanki Issued Date: July 14, 2010	Tested by: Wayne Wu, RFI Engineer Test Dates: July 06-13, 2010

- *The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.*
- *This report must not be used by the client to claim product endorsement by NVLAP or any agency of the US Government.*

UltraTech

3000 Bristol Circle, Oakville, Ontario, Canada, L6H 6G4
Tel.: (905) 829-1570 Fax.: (905) 829-8050
Website: www.ultratech-labs.com Email: vic@ultratech-labs.com, Email: tri.luu@sympatico.ca

FCC	VCCI	Industry Canada / Industrie Canada Approved Test Facility	NVLAP	BSMI	Korea KCC-RRL
91038	1309	46390-2049	NvLap Lab Code 200093-0	SL2-IN-E-1119R	CA2049

TABLE OF CONTENTS

EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 25 Subpart C
Title:	Telecommunication - Code of Federal Regulations, CFR 47, Parts 2 & 25 Subpart C
Purpose of Test:	To gain FCC Certification Authorization for Radio operating in the frequency bands 1616.0-1626.5 MHz
Test Procedures:	Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz.

1.2. RELATED SUBMITAL(S)/GRANT(S)

None

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 2 and 25	2009	Code of Federal Regulations – Telecommunication
ANSI C63.4	2004	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz
CISPR 16-1-1	2004	Specification for Radio Disturbance and Immunity measuring apparatus and methods
TIA/EIA 603, Edition C	2004	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards

EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

APPLICANT:	
Name:	GeoPro LBS Inc.
Address:	755 Queensway, Suite 200 Mississauga, Ontario Canada, L4Y 4C5
Contact Person:	Mr. Jeff Wilson Phone #: 905-272-1734 ext. 251 Fax #: (905) 272-0127 Email Address: jwilson@geoprosolutions.com.com

MANUFACTURER:	
Name:	GeoPro LBS Inc.
Address:	755 Queensway, Suite 200 Mississauga, Ontario Canada, L4Y 4C5
Contact Person:	Mr. Jeff Wilson Phone #: 905-272-1734 ext. 251 Fax #: (905) 272-0127 Email Address: jwilson@geoprosolutions.com.com

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	GeoPro LBS Inc.
Product Name:	GeoPro Messenger
Model Name or Number:	GPM-1000
Serial Number:	N/A
EUT Application:	The GeoPro *Messenger* is a satellite communications device with location data from GPS that enables users to send short (160-character) text messages, perform check-ins, and signal emergencies. The device communicates with the GeoPro Web Application and can be used to message other email, cellular phone, or GeoPro users. It also enables authorized persons to track user movement in the field.
Type of Equipment:	Non-broadcast Radio Communication Equipment
Power Supply:	Main Input Voltage: 3.0VDC to 5.0VDC Peak Current: 1.5A @ 4.2VDC Battery Type: Lithium Ion Battery Capacity: 2.3 A-Hr Charging Voltage: USB 1.0, USB 2.0 or 4–5VDC Rechargeable Cycles: 500 times Batteries will be supplied by GeoPro LBS Inc..

2.3. EUT'S TECHNICAL SPECIFICATIONS

TRANSMITTER	
Equipment Type:	Portable: held to face or boy-worn
Intended Operating Environment:	[x] Commercial [x] Light Industry & Heavy Industry
Power Supply Requirement:	Main Input Voltage: 3.0VDC to 5.0VDC Peak Current: 1.5A @ 4.2VDC Battery Type: Lithium Ion Battery Capacity: 2.3 A-Hr Charging Voltage: USB 1.0, USB 2.0 or 4–5VDC Rechargeable Cycles: 500 times Batteries will be supplied by Roadpost.
RF Output Power Rating:	3.5 Watts Peak EIRP
Duty Cycle:	9.2%
Operating Frequency Range:	1616-1626.5 MHz
RF Output Impedance:	50 Ohms
Channel Spacing:	41.667 kHz (252 channels)
Occupied Bandwidth (99%):	32.3 kHz
Modulation:	V7W
Emission Designation*:	32K3V7W
Antenna Connector Type:	SMA type
Antenna Description:	**Option #1**: Sarantel Passive Iridium Antenna, Part No.: SL3101, Frequency range: 1616-1626 MHz, Gain +2 dBi **Option #2**: Maxtena Antenna (Quadrifilar Antenna for Iridium Band (RHCP)), Part No.: M1621HCT, Frequency range: 1616-1626 MHz, Gain +2.5 dBi maximum

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	ANT –RF	1	SMA	No cable
2	USB Port for battery charger	1	Mini- USB	Shielded

2.5. LIST OF ACCESSORIES:

(1) Option #1: Kodak External Switching AC/DC Adaptor (Battery Charger), Model TESA5G1-0501200, FCC Class B Approved, USB connector.
(2) Option #2: Friwo Geraetebau GMBH External AC/DC Adapter (Battery Charger), Type: FW7711/0.7, USB Connector

EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	23°C
Humidity:	55%
Pressure:	102 kPa
Power input source:	5 Vdc

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	Special Set-up Software used to setup frequency, power level and channel spacing.
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ohms RF Load.

Transmitter Test Signals	
Frequency Band(s): ▪ 1616.022 - 1626.5 MHz band	Near lowest & near highest frequencies in each frequency bands that the transmitter covers: • 1616.022000 & 1625.980413 MHz
Transmitter Wanted Output Test Signals: ▪ RF Power Output (measured maximum output power): ▪ Normal Test Modulation ▪ Modulating signal source:	 ▪ 3.5 Watts Peak EIRP ▪ V7W ▪ Internal

3.3. TEST SETUP BLOCK DIAGRAM

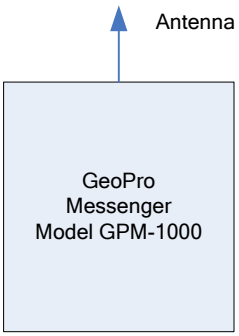


EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

- Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with FCC office (FCC File No.: 91038) and Industry Canada office (Industry Canada File No.: 2049A-3). Expiry Date: 2011-05-01.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC PARAGRAPH	TEST REQUIREMENTS	APPLICABILITY (YES/NO)
25.204(a)	Power Limit	Yes
1.1307, 1.1310, 2.1091 & 2.1093	RF Exposure Limit	Yes, See SAR test report for details.
2.1049	99% Occupied Bandwidth	Yes
2.1055, 25.202(d)	Frequency Stability	Yes
2.1051, 25.202(f) & 25.213	Emission Masks measured at antenna terminal	Yes
2.1051, 25.202(f) & 25.213	Spurious Emissions at antenna terminal	Yes
2.1053, 25.202(f) & 25.213	Emission Limits - Field Strength of Spurious Emissions	Yes
GeoPro Messenger, **Model No.: GPM-1000**, by **GeoPro LBS Inc.** has also been tested and found to comply with **FCC Part 15, Subpart B - Radio Receivers and Class B Digital Devices**. The engineering test report has been documented and kept in file, RPDT-001FCC15B and it is available anytime upon FCC request.		

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None

EXHIBIT 5. MEASUREMENTS, EXAMINATIONS & TEST DATA FOR EMC EMISSIONS

5.1. TEST PROCEDURES

This section contains test results only. Details of test methods and procedures can be found in Exhibit 8 of this report

5.2. MEASUREMENT UNCERTAINTIES

The measurement uncertainties stated were calculated in accordance with requirements of UKAS Document NIS 81 with a confidence level of 95%. Please refer to Exhibit 7 for Measurement Uncertainties.

5.3. MEASUREMENT EQUIPMENT USED:

The measurement equipment used complied with the requirements of the Standards referenced in the Methods & Procedures ANSI C63.4 and CISPR 16-1-1

5.4. ESSENTIAL/PRIMARY FUNCTIONS AS DECLARED BY THE MANUFACTURER:

The essential function of the EUT is to correctly communicate data to and from radios over RF link.

5.5. POWER LIMITS @ FCC 25.204(A)

5.5.1. Limits

§ 25.204(a) Power limits: In bands shared coequally with terrestrial radio communication services, the equivalent isotropically radiated power transmitted in any direction towards the horizon by an earth station, other than an ESV, operating in frequency bands between 1 and 15 GHz, shall not exceed the following limits except as provided for in paragraph (c) of this section:

+40 dBW in any 4 kHz band for $\Theta \leq 0°$
+40 + 3 Θ dBW in any 4 kHz band for $0° < \Theta \leq 5°$

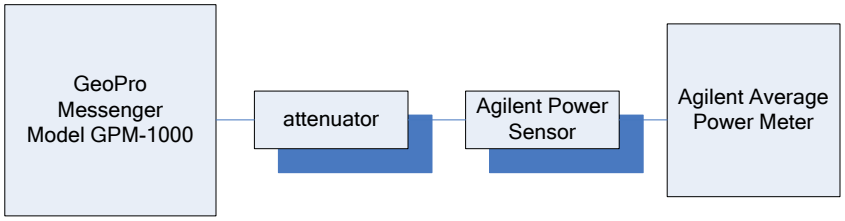
where Θ is the angle of elevation of the horizon viewed from the center of radiation of the antenna of the earth station and measured in degrees as positive above the horizontal plane and negative below it.

5.5.2. Method of Measurements

The output power shall be measured when the transmitter is operating at the manufacturer's rated power and modulated with signals representative (i.e. typical) of those encountered in a real system operation. This measurement shall be carried out before the other tests.
If the power is in bursts, the power shall be averaged over any 100 millisecond interval, or over the burst interval if the burst is shorter than 100 milliseconds, during which its value is at its maximum.

Record the output power in.

5.5.3. Test Arrangement



5.5.4. Test Data

Channel Number	Fundamental Frequency (MHz)	Attenuator (dB)	Level at Power Meter (dBm)	Antenna Gain (dBi)	Duty Cycle Factor (dB)	Peak EIRP (dBm)	Peak EIRP (dBW)	Limit (dBW)
1	1616.022000	19.83	13.05	2.5	10.34	35.38	5.38	40.0
75	1616.063667	19.83	13.06	2.5	10.34	35.39	5.39	40.0
150	1622.230383	19.83	13.05	2.5	10.34	35.38	5.38	40.0
240	1625.980413	19.83	12.85	2.5	10.34	35.18	5.18	40.0

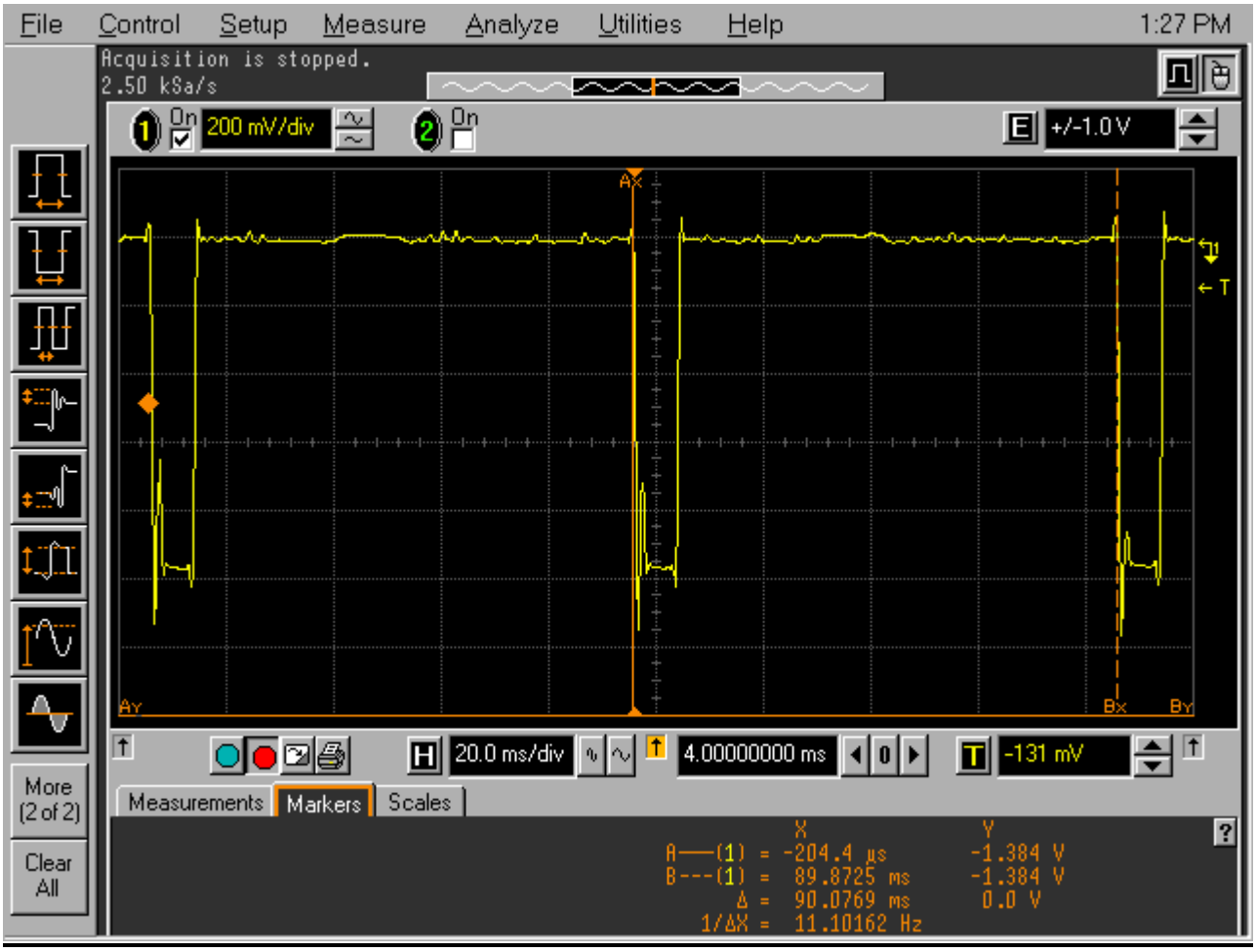
Refer to Plot #1 & Plot#2 for duty cycle measurements

ON time = 8.3327 mS

Frame time = 90.70769 mS

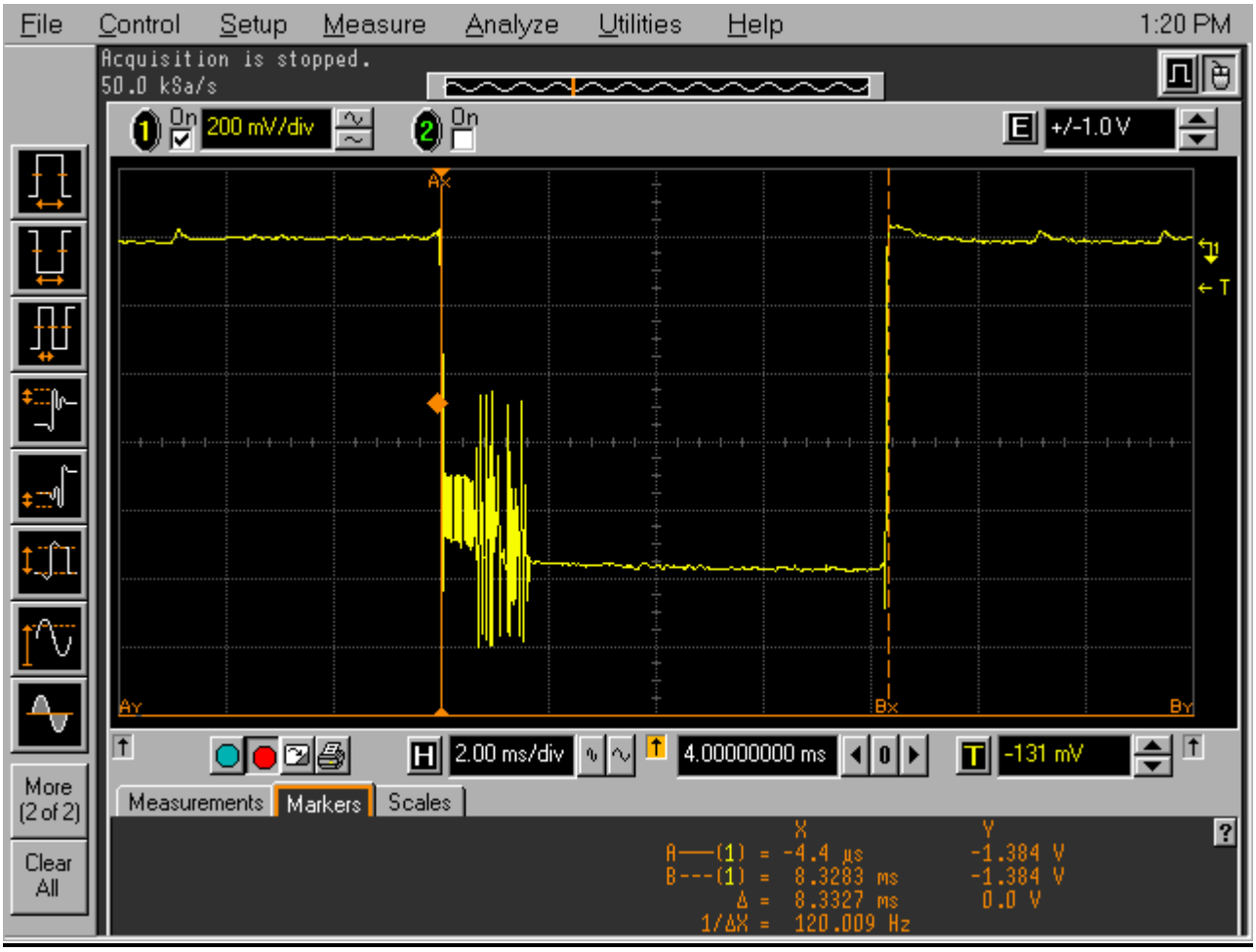
Duty Cycle = 8.3327 mS / 90.70769 mS = 0.09186 or 9.2%

Plot #1: Duty Cycle Measurements (using negative detector)



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot #2: Duty Cycle Measurements (using negative detector)



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

5.6. 99% OCCUPIED BANDWIDTH @ FCC 2.1049

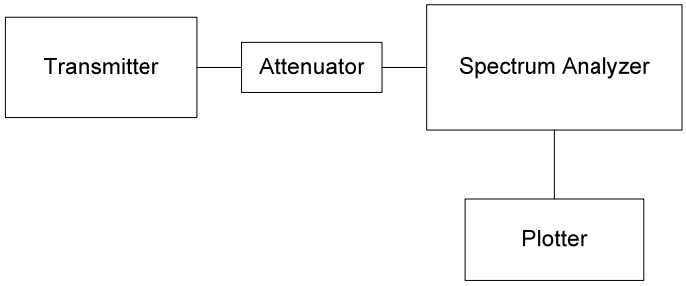
5.6.1. Limits

Not Specified.

5.6.2. Method of Measurements

The 99% occupied bandwidth is measured using EMI receiver (spectrum analyzer) with RBW = 1% of 99% OBW, VBW >= RBW.

5.6.3. Test Arrangement

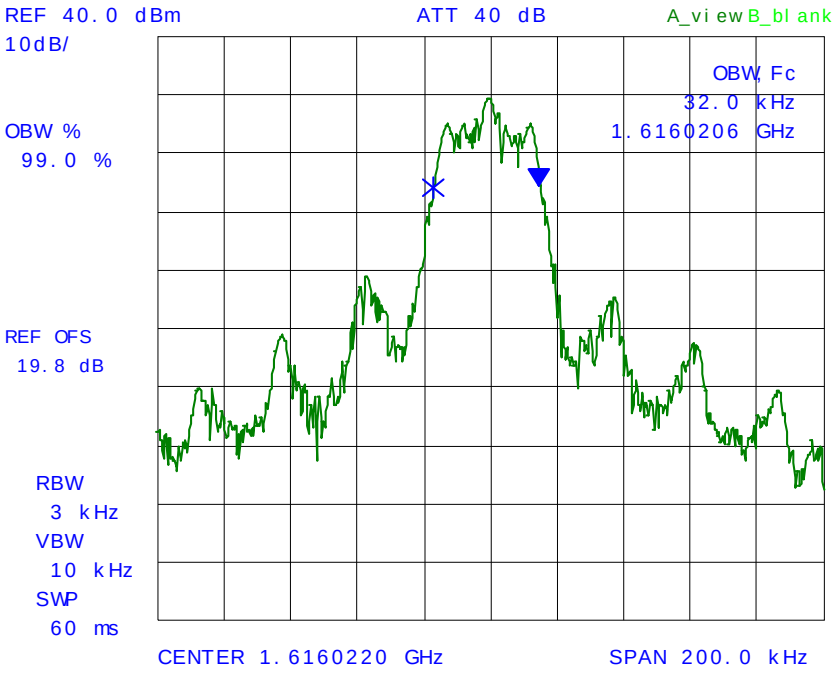


5.6.4. Test Data

Transmitter Channel	Fundamental Frequency (MHz)	Channel Spacing (KHz)	99% Occupied Bandwidth (KHz)
1	1616.02200000	41.667	32.0
240	1625.958413	41.667	32.3

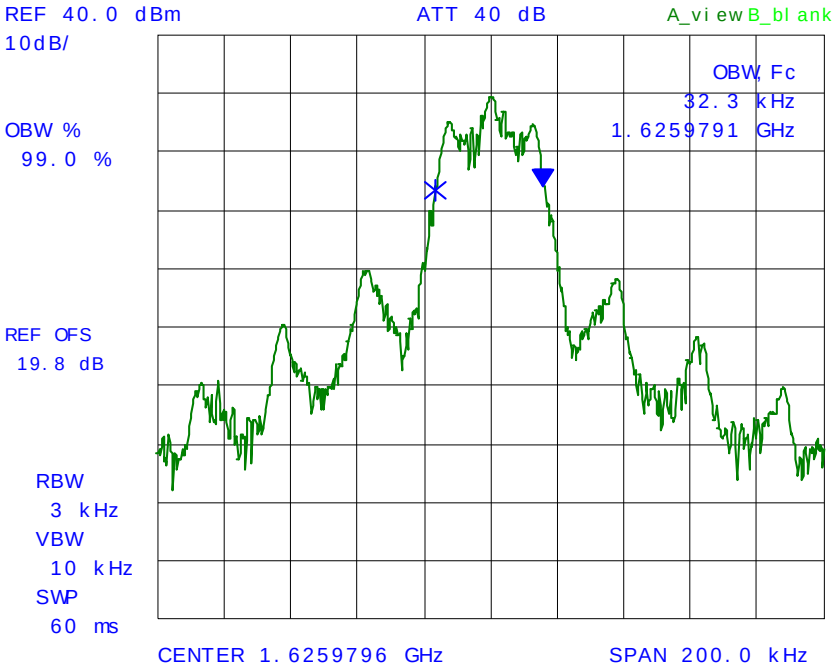
Please refer to Plots # 3 to 4 for details of measurements.

Plot # 3: 99% Occupied Bandwidth
Frequency: 1616.022 MHz, Power Output; 2.88 dBW



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 4: 99% Occupied Bandwidth
Frequency: 1625.958413 MHz, Power Output; 2.68 dBW



5.7. FREQUENCY STABILITY [§ 2.1055 & 25.202(D)]

5.7.1. Limits § 25.202(d)

The carrier frequency of each earth station transmitter authorized in these services shall be maintained within 0.001 percent of the reference frequency.

5.7.2. Method of Measurements

Refer to Section 8.2 of this report for measurement details

5.7.3. Test Data

Referenced center Frequency:	1616.0172 MHz
Full Power Level:	Maximum
Frequency Tolerance Limit:	±0.001% of frequency reference or ±10 ppm or 1616 Hz
Max. Frequency Tolerance Measured:	-530 Hz or -0.33 ppm
Input Voltage Rating:	3 – 5 Vdc

Ambient Temperature (°C)	**CENTER FREQUENCY & RF POWER OUTPUT VARIATION**		
	Supply Voltage (Nominal) 5 VDC	**Supply Voltage (lowest rating) 3 Vdc**	**Supply Voltage (115% of maximum ratings) 5.75 Vdc**
	Hz	**Hz**	**Hz**
-30	-150	N/A	N/A
-20	+230	N/A	N/A
-10	+150	N/A	N/A
0	-75	N/A	N/A
+10	-75	N/A	N/A
+20	0.0	0.0	0.0
+30	-150	N/A	N/A
+40	-450	N/A	N/A
+50	-530	N/A	N/A
+60	-530	N/A	N/A

5.8. EMISSION MASKS @ FCC 2.1053, 25.202(F) & 25.213

5.8.1. Limits @ 25.202(f):

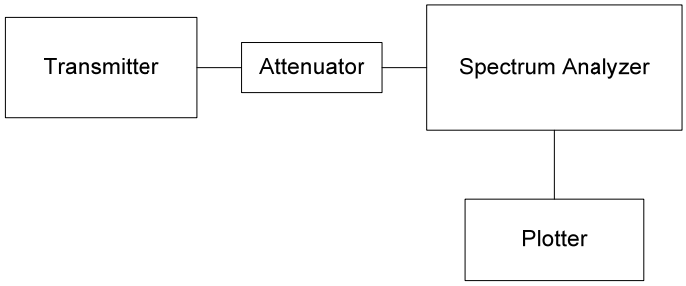
The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule:

(1) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: 25 dB;
(2) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: 35 dB;
(3) In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

5.8.2. Method of Measurements

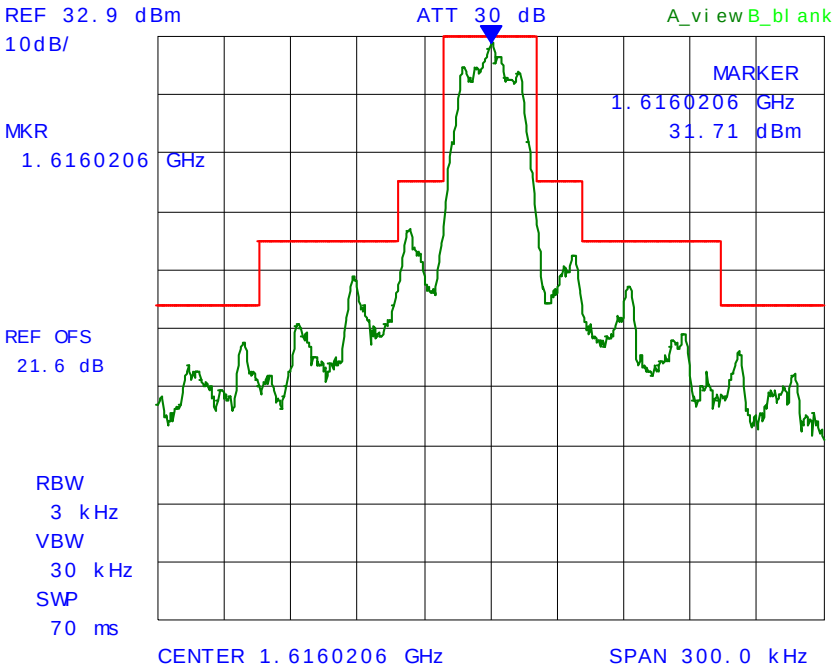
Refer to Section 8.4 of this report for measurement details

5.8.3. Test Arrangement



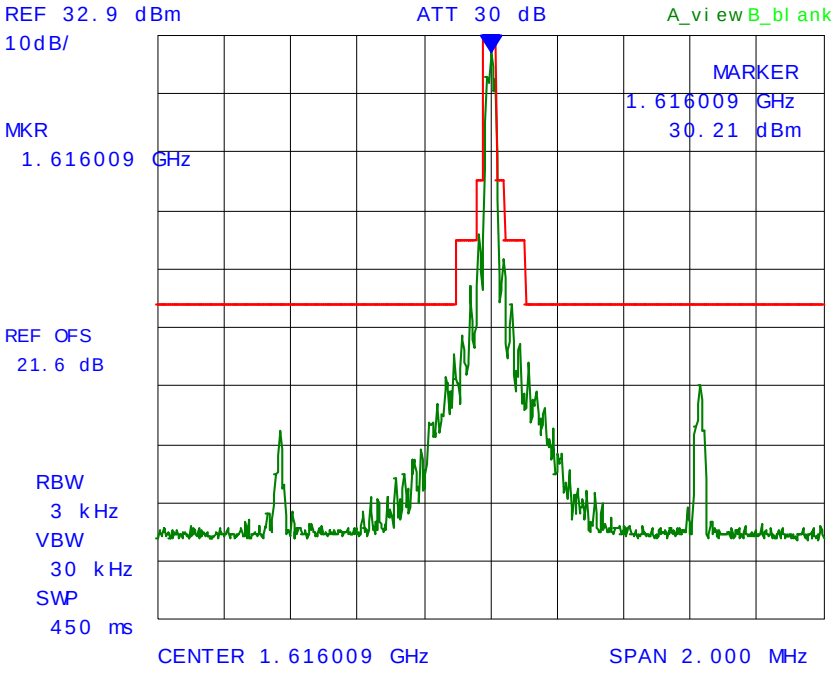
5.8.4. Test Data

Plot # 5(a): Emission Mask
Frequency: 1616.022 MHz, Power Output; 2.88 dBW



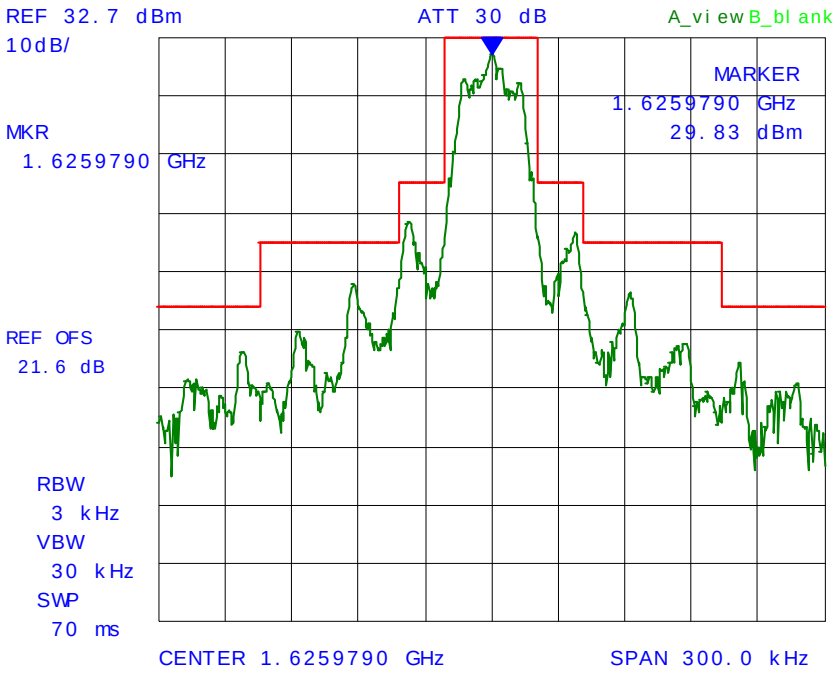
- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 5(a): Emission Mask
Frequency: 1616.022 MHz, Power Output; 2.88 dBW

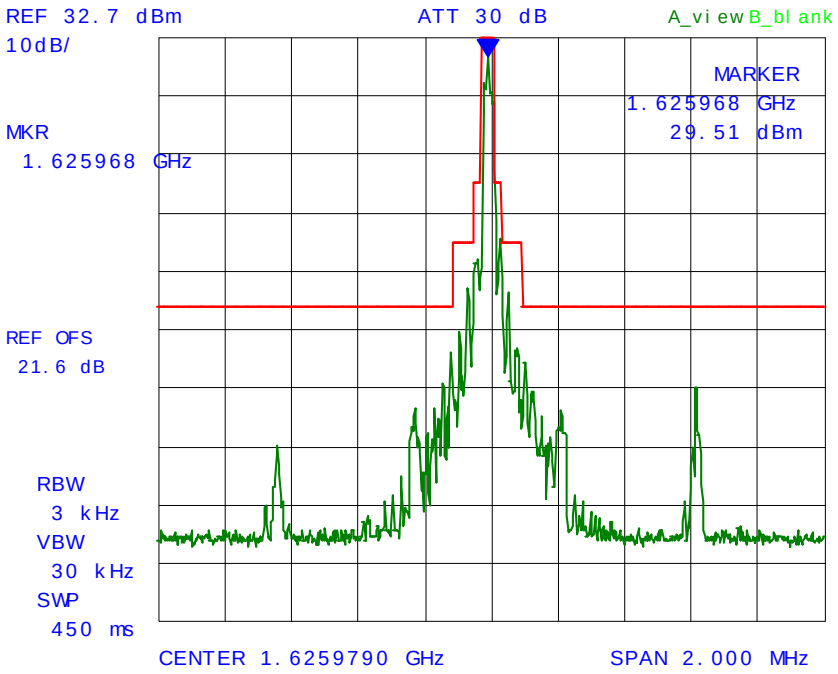


- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

Plot # 6(a): Emission Mask
Frequency: 1625.958413 MHz, Power Output; 2.68 dBW



Plot # 6(b): Emission Mask
Frequency: 1625.958413 MHz, Power Output; 2.68 dBW



5.9. TRANSMITTER SPURIOUS/HARMONIC CONDUCTED EMISSIONS @ FCC 2.1053, 25.202(F)(3) & 25.213

5.9.1. Limits @ 25.202(f)(3):

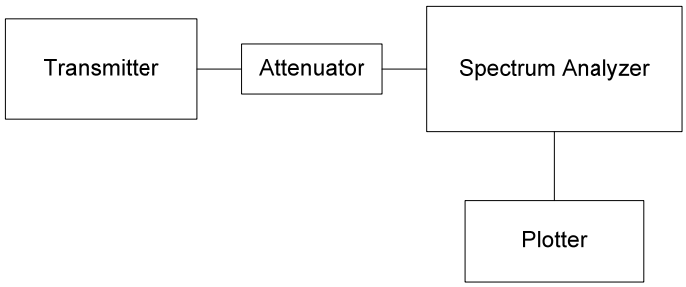
FCC Rules	Frequency Range	Attenuation Limit (dBc)
§ 25.202(f)(3)	10 MHz to Lowest frequency of the radio to 10th harmonic of the highest frequency of the radio	At least 43 + 10 log(P) or -13 dBm

In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

5.9.2. Method of Measurements

Refer to Section 8.4 of this report for measurement details

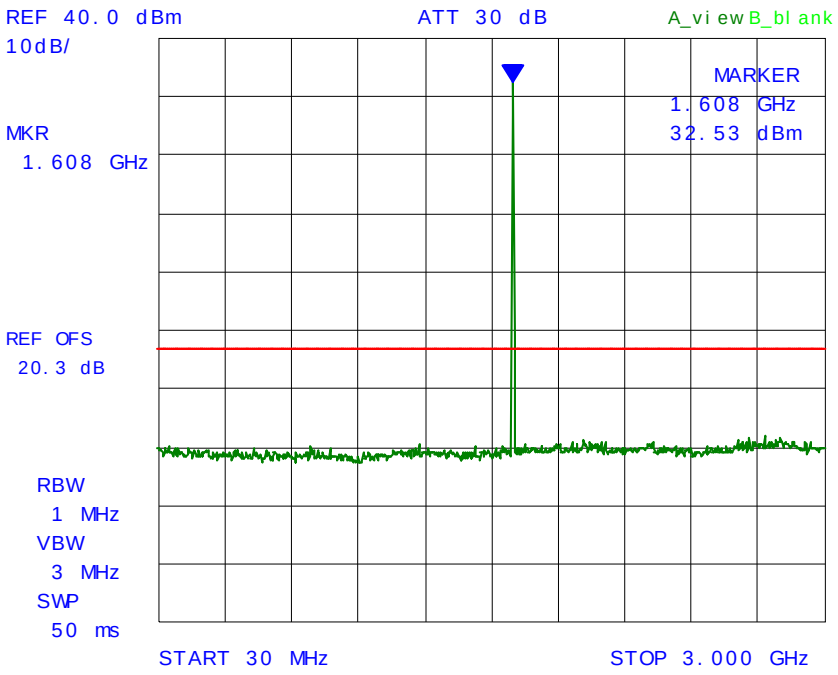
5.9.3. Test Arrangement



5.9.4. Test Data

5.9.4.1. Near Lowest Frequency (1616.022 MHz)

Fundamental Frequency:	1616.022 MHz
RF Output Power:	2.88 dBW conducted power (maximum)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies



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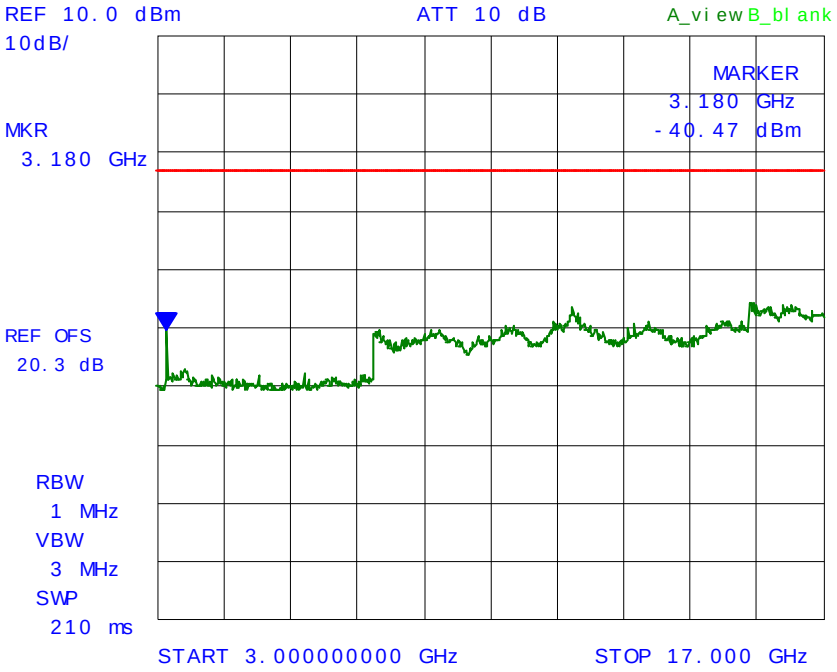
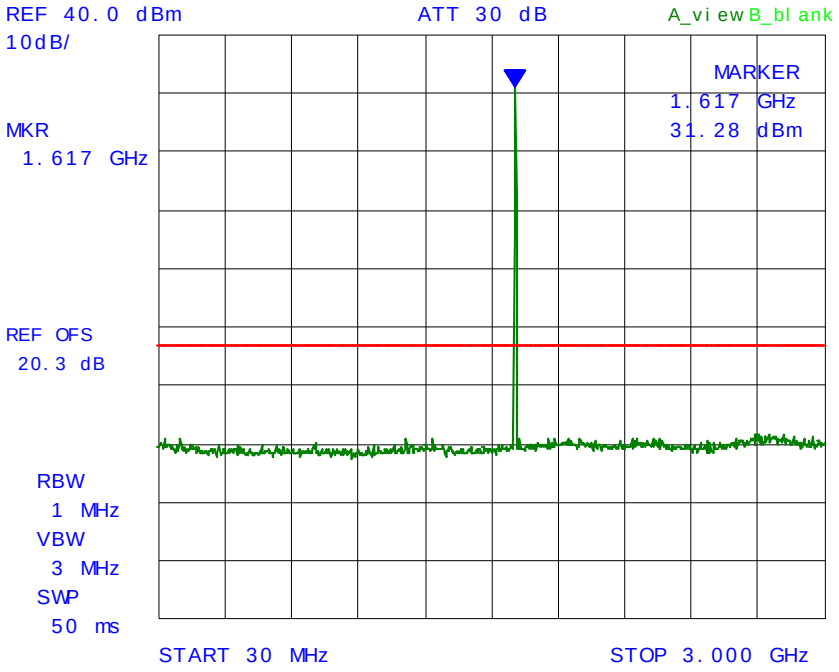
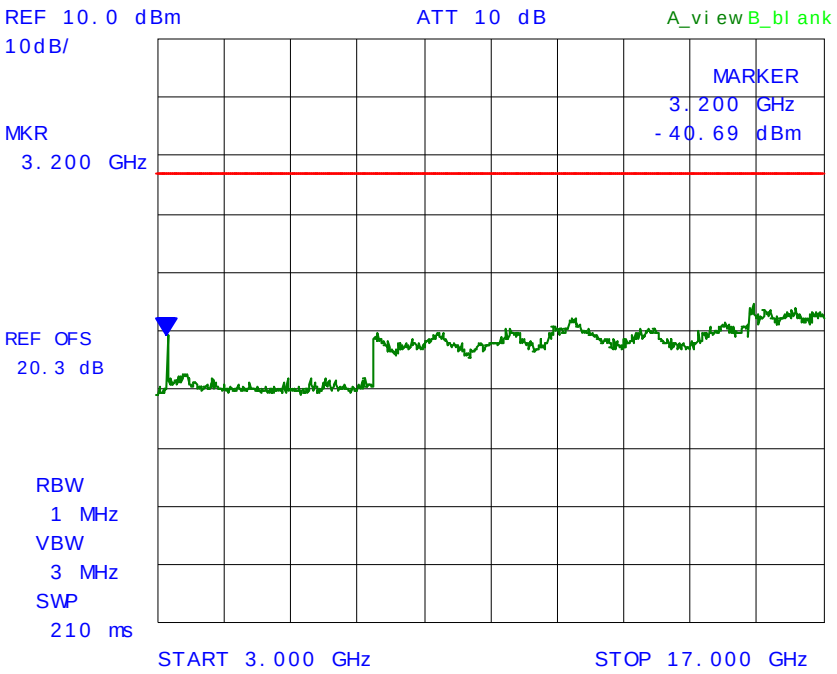

REF 10.0 dBm
ATT 10 dB
A_view B_blank
10dB/
MARKER
3.180 GHz
-40.47 dBm
MKR
3.180 GHz
REF OFS
20.3 dB
RBW
1 MHz
VBW
3 MHz
SWP
210 ms
START 3.000000000 GHz
STOP 17.000 GHz

5.9.4.2. Near Highest Frequency (1625.980413 MHz)

Fundamental Frequency:	1625.980413 MHz
RF Output Power:	2.68 dBW conducted power (maximum)
Test Frequency Range:	10 kHz to 17 GHz
Limits:	-13 dBm
Results:	Complies




REF 10.0 dBm
ATT 10 dB
A_view B_blank
10dB/
MARKER
3.200 GHz
-40.69 dBm
MKR
3.200 GHz
REF OFS
20.3 dB
RBW
1 MHz
VBW
3 MHz
SWP
210 ms
START 3.000 GHz
STOP 17.000 GHz

5.10. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS @ FCC 2.1053, 25.202(F)(3) & 25.213

5.10.1. Limits @ 25.202(f)(3):

25.202(f)(3) - The mean power of emissions shall be attenuated below the mean output power of the transmitter in accordance with the following schedule: In any 4 kHz band, the center frequency of which is removed from the assigned frequency by more than 250 percent of the authorized bandwidth: An amount equal to 43 dB plus 10 times the logarithm (to the base 10) of the transmitter power in watts;

In any event, when an emission outside of the authorized bandwidth causes harmful interference, the Commission may, at its discretion, require greater attenuation than specified in paragraphs (f) (1), (2) and (3) of this section.

5.10.2. Method of Measurements

The spurious/harmonic ERP measurements are using substitution method specified in Exhibit 7, § 7.1 of this report and its value in dBc is calculated as follows:

1. If the transmitter's antenna is an integral part of the EUT, the ERP is measured using substitution method.
2. If the transmitter's antenna is non-integral and diverse, the lowest ERP of the carrier with 0 dBi antenna gain is used for calculation of the spurious/harmonic emissions in dBc:
3. Lowest ERP of the carrier = EIRP – 2.15 dB = Pc + G - 2.15 dB = xxx dBm (conducted) + 0 dBi – 2.15 dB
4. Spurious /harmonic emissions levels expressed in dBc (dB below carrier) are as follows:

   ERP of spurious/harmonic (dBc) = ERP of carrier (dBm) – ERP of spurious/harmonic emission (dBm)

5.10.3. Test Data

5.10.3.1. Near Lowest Frequency (1616.022 MHz)

Fundamental Frequency:	1616.022 MHz
RF Output Power:	33.23 dBm ERP (maximum)
Test Frequency Range:	10 kHz to 17 GHz

Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP measured by Substitution Method (dBm)	ERP measured by Substitution Method (dBc)	Limit (dBc)	Margin (dB)
107.7	22.0	Peak	V	-73.2	-108.6	-48.4	-60.2
107.7	38.3	Peak	H	-56.9	-92.3	-48.4	-43.9
219.2	31.8	Peak	V	-63.5	-98.8	-48.4	-50.5
219.2	31.5	Peak	H	-63.8	-99.1	-48.4	-50.8
369.6	28.8	Peak	V	-66.4	-101.8	-48.4	-53.4
369.6	23.0	Peak	H	-72.2	-107.6	-48.4	-59.2
453.6	24.2	Peak	V	-71.0	-106.4	-48.4	-58.0
453.6	34.3	Peak	H	-60.9	-96.3	-48.4	-47.9
3232.0	61.8	Peak	V	-33.5	-68.8	-48.4	-20.5

All other emissions are more than 50 dB below the limit.

5.10.3.2. Near Highest Frequency (1625.980413 MHz)

Fundamental Frequency:	1625.980413 MHz
RF Output Power:	33.03 dBm ERP conducted power (maximum)
Test Frequency Range:	10 kHz to 17 GHz

Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP)	Antenna Polarization (H/V)	ERP measured by Substitution Method (dBm)	ERP measured by Substitution Method (dBc)	Limit (dBc)	Margin (dB)
107.7	22.0	Peak	V	-73.2	-106.4	-48.2	-58.2
107.7	38.3	Peak	H	-56.9	-90.1	-48.2	-41.9
219.2	31.8	Peak	V	-63.5	-96.6	-48.2	-48.5
219.2	31.5	Peak	H	-63.8	-96.9	-48.2	-48.8
369.6	28.8	Peak	V	-66.4	-99.6	-48.2	-51.4
369.6	23.0	Peak	H	-72.2	-105.4	-48.2	-57.2
453.6	24.2	Peak	V	-71.0	-104.2	-48.2	-56.0
453.6	34.3	Peak	H	-60.9	-94.1	-48.2	-45.9
3252.0	58.7	Peak	V	-36.5	-69.7	-48.2	-21.5

All other emissions are more than 50 dB below the limit.

EXHIBIT 6. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of NIST Technical Note 1297 and NIS 81 (1994)

6.1. RADIATED EMISSION MEASUREMENT UNCERTAINTY

CONTRIBUTION (Radiated Emissions)	PROBABILITY DISTRIBUTION	UNCERTAINTY (± dB)	
		3 m	10 m
Antenna Factor Calibration	Normal (k=2)	±1.0	±1.0
Cable Loss Calibration	Normal (k=2)	±0.3	±0.5
EMI Receiver specification	Rectangular	±1.5	±1.5
Antenna Directivity	Rectangular	+0.5	+0.5
Antenna factor variation with height	Rectangular	±2.0	±0.5
Antenna phase center variation	Rectangular	0.0	±0.2
Antenna factor frequency interpolation	Rectangular	±0.25	±0.25
Measurement distance variation	Rectangular	±0.6	±0.4
Site imperfections	Rectangular	±2.0	±2.0
Mismatch: Receiver VRC $\Gamma_1 = 0.2$ Antenna VRC $\Gamma_R = 0.67$(Bi) 0.3 (Lp) Uncertainty limits $20\text{Log}(1\pm\Gamma_1\Gamma_R)$	U-Shaped	+1.1 -1.25	±0.5
System repeatability	Std. Deviation	±0.5	±0.5
Repeatability of EUT		-	-
Combined standard uncertainty	Normal	+2.19 / -2.21	+1.74 / -1.72
Expanded uncertainty U	Normal (k=2)	+4.38 / -4.42	+3.48 / -3.44

Calculation for maximum uncertainty when 3m biconical antenna including a factor of k=2 is used:

$U = 2u_c(y) = 2x(+2.19) = +4.38$ dB And $U = 2u_c(y) = 2x(-2.21) = -4.42$ dB

- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

EXHIBIT 7. TEST INSTRUMENT LIST

Item #	Tes instruments	Manufacturer	Model No	Serial No	General Specification
1	EMC Analyzer	Hewlett-Packard	8593EM	3412A00103	9 KHz - 26.5 GHz
2	Power Meter	Agilent	N1911A	MY45100734	30 MHz – 40 GHz
3	Power sensor	Agilent	N1921	MY45241127	50 MHz - 18 GHz
4	Infinium Digital Oscilloscope	Hewlett-Packard	54801A	US38380192	DC -500 MHz 1G sampling
5	High Pass Filter	Mini-Circuit	SLP-1000		Cut of Frequency 1000 MHz
6	High Pass Filter	K&L	115H10-3000	4	Cut of Frequency 2700 MHz
7	RF Detector	Hewlett-Packard	423B	1965	10 MHz – 12 GHz
8	Attenuator	Weinschel	46-20-34	BS5681	20dB DC-18 GHz, 25W
9	Spectrum Analyzer	Advantest	R3271	15050203	100 Hz--26.5GHz
10	RF Detector	Hewlett-Packard	423B	1965	10 MHz -12.4 GHz
11	Biconilog Antenna	ETS	3142B	1575	26 MHz - 2000MHz
12	Horn Antenna	ETS	3115	5061	1GHz - 18GHz
13	Pre-Ampilifier	Hewlett-Packard	8447D	2944A07673	0.1MHz - 1300MHz
14	Pre-Ampilifier	Hewlett-Packard	83017A	3116A00661	0.5GHz - 26.5GHz
15	RF Signal Generator	Hewlett-Packard	8648C	3443U00391	0.1MHz - 3200MHz
16	Power Meter	Hewlett-Packard	437B	3125U06665	100 KHz - 50 GHz
17	Power sensor	Hewlett-Packard	8481A	US37295684	10 MHz - 18 GHz
18	Environmental chamber	Envirotronic	SSH32C	11994847-5-11059	-65 to 177 degree C

EXHIBIT 8. MEASUREMENT METHODS

8.1. RADIATED POWER MEASUREMENTS (ERP & EIRP) USING SUBSTITUTION METHOD

8.1.1. MAXIMIZING RF EMISSION LEVEL (E-FIELD)

(a) The measurements were performed with full rf output power and modulation.
(b) Test was performed at listed 3m open area test site (listed with FCC, IC, ITI, NVLAP, ACA & VCCI).
(c) The transmitter under test was placed at the specified height on a non-conducting turntable (80 cm height)
(d) The BICONILOG antenna (20 MHz to 1 GHz) or HORN antenna (1 GHz to 18 GHz) was used for measuring.
(e) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBμV/m) = Reading (dBμV) + Total Correction Factor (dB/m)

(f) Set the EMI Receiver and #2 as follows:

Center Frequency:	test frequency
Resolution BW:	100 KHz
Video BW:	same
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(g) The test antenna was lowered or raised from 1 to 4 meters until the maximum signal level was detected.
(h) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(i) The test antenna was lowered or raised again from 1 to 4 meters until a maximum was obtained. This level was recorded.
(j) The recorded reading was corrected to the true field strength level by adding the antenna factor, cable loss and subtracting the pre-amplifier gain.
(k) The above steps were repeated with both transmitters' antenna and test receiving antenna placed in vertical and horizontal polarization. Both readings with the antennas placed in vertical and horizontal polarization shall be recorded.
(l) Repeat for all different test signal frequencies.

8.1.2. Measuring the EIRP of Spurious/Harmonic Emissions using Substitution Method

(a) Set the EMI Receiver (for measuring E-Field) and Receiver #2 (for measuring EIRP) as follows:

Center Frequency:	equal to the signal source
Resolution BW:	100 KHz
Video BW:	VBW > RBW
Detector Mode:	positive
Average:	off
Span:	3 x the signal bandwidth

(b) Load an appropriate correction factors file in EMI Receiver for correcting the field strength reading level

Total Correction Factor recorded in the EMI Receiver = Cable Loss + Antenna Factor
E (dBuV/m) = Reading (dBuV) + Total Correction Factor (dB/m)

(c) Select the frequency and E-field levels obtained in the Section 8.2.1 for ERP/EIRP measurements.
(d) Substitute the EUT by a signal generator and one of the following transmitting antenna (substitution antenna):
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(e) Mount the transmitting antenna at 1.5 meter high from the ground plane.
(f) Use one of the following antenna as a receiving antenna:
- DIPOLE antenna for frequency from 30-1000 MHz or
- HORN antenna for frequency above 1 GHz }.

(g) If the DIPOLE antenna is used, tune it's elements to the frequency as specified in the calibration manual.
(h) Adjust both transmitting and receiving antenna in a VERTICAL polarization.
(i) Tune the EMI Receivers to the test frequency.
(j) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(k) The transmitter was rotated through 360^{o} about a vertical axis until a higher maximum signal was received.
(l) Lower or raise the test antenna from 1 to 4 meters until the maximum signal level was detected.
(m) Adjust input signal to the substitution antenna until an equal or a known related level to that detected from the transmitter was obtained in the test receiver.
(n) Record the power level read from the Average Power Meter and calculate the ERP/EIRP as follows:

P = P1 - L1 = (P2 + L2) – L1 = P3 + A + L2 - L1
EIRP = P + G1 = P3 + L2 - L1 + A + G1
ERP = EIRP – 2.15 dB
Total Correction factor in EMI Receiver # 2 = L2 – L1 + G1

Where:	P:	Actual RF Power fed into the substitution antenna port after corrected.
	P1:	Power output from the signal generator
	P2:	Power measured at attenuator A input
	P3:	Power reading on the Average Power Meter
	EIRP:	EIRP after correction
	ERP:	ERP after correction

(o) Adjust both transmitting and receiving antenna in a HORIZONTAL polarization, then repeat step (k) to (o)
(p) Repeat step (d) to (o) for different test frequency
(q) Repeat steps (c) to (j) with the substitution antenna oriented in horizontal polarization.
(r) Actual gain of the EUT's antenna is the difference of the measured EIRP and measured RF power at the RF port. Correct the antenna gain if necessary.

Figure 2

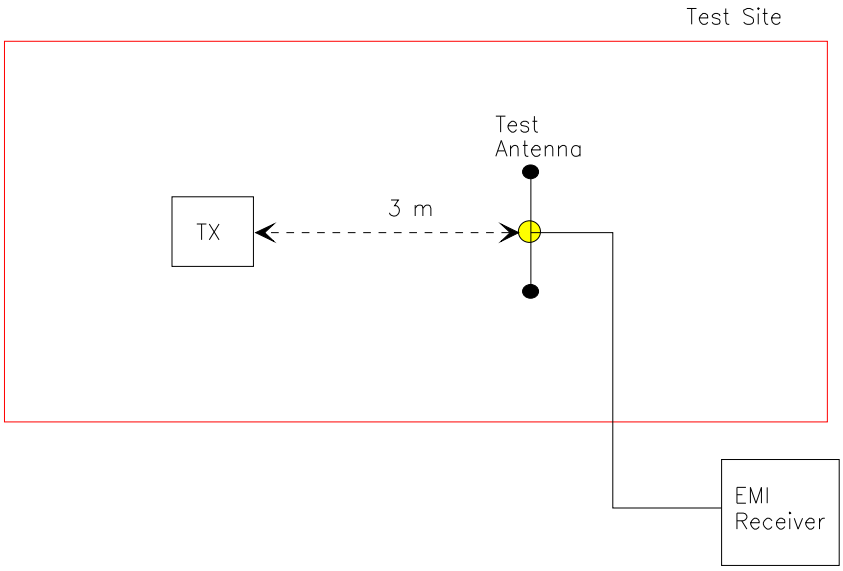
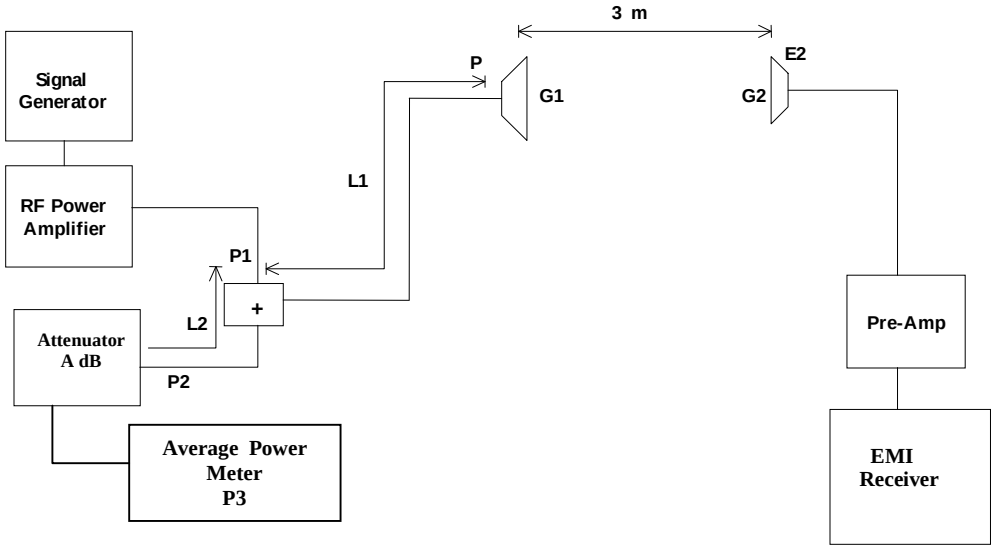


Figure 3



- *All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)*

8.2. FREQUENCY STABILITY

Refer to FCC @ 2.1055.

(a) The frequency stability shall be measured with variation of ambient temperature as follows: From -30 to +50 centigrade except that specified in subparagraph (2) & (3) of this paragraph.

(b) Frequency measurements shall be made at extremes of the specified temperature range and at intervals of not more than 10 centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short-term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stability circuitry need be subjected to the temperature variation test.

(d) The frequency stability supply shall be measured with variation of primary supply voltage as follows:

(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.

(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

(3) The supply voltage shall be measured at the input to the cable normally provide with the equipment, or at the power supply terminals if cables are not normally provided. Effects on frequency of transmitter keying (except for broadcast transmitters) and any heating element cycling at the nominal supply voltage and at each extreme also shall be shown.

(e) When deemed necessary, the Commission may require tests of frequency stability under conditions in addition to those specifically set out in paragraphs (a), (b), (c) and (d) of this section. (For example, measurements showing the effect of proximity to large metal objects, or of various types of antennas, may be required for portable equipment).

8.3. EMISSION MASK

Voice or Digital Modulation Through a Voice Input Port @ 2.1049(c)(i):- The transmitter was modulated by a 2.5 KHz tone signal at an input level 16 dB greater than that required to produce 50% modulation (e.g.: ±2.5 KHz peak deviation at 1 KHz modulating frequency). The input level was established at the frequency of maximum response of the audio modulating circuit.

Digital Modulation Through a Data Input Port @ 2.1049(h):- Transmitters employing digital modulation techniques - when modulated by an input signal such that its amplitude and symbol rate represent the maximum rated conditions under which the equipment will be operated. The signal shall be applied through any filter networks, pseudo-random generators or other devices required in normal service. Additionally, the Emission Masks shall be shown for operation with any devices used for modifying the spectrum when such devices are operational at the discretion of the user.

The following EMI Receiver bandwidth shall be used for measurement of Emission Mask/Out-of-Band Emission Measurements:

(1) For 25 KHz Channel Spacing: RBW = 300 Hz
(2) For 12.5 KHz or 6.25 KHz Channel Spacings: RBW = 100 Hz

The all cases the Video Bandwidth shall be equal or greater than the measuring bandwidth.

8.4. SPURIOUS EMISSIONS (CONDUCTED)

With transmitter modulation characteristics described in Out-of-Band Emissions measurements @ 2.1049, the transmitter spurious and harmonic emissions were scanned. The spurious and harmonic emissions were measured with the EMI Receiver controls set as RBW = 30 KHz minimum , VBW ≥ RBW and SWEEP TIME = AUTO). The transmitter was operated at a full rated power output, and modulated as follows:

FCC 47 CFR 2.1057 - Frequency spectrum to be investigated: The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10^{th} harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC 47 CFR 2.1051 - Spurious Emissions at Antenna Terminal: The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.1049 as appropriate. The magnitude of spurious emissions, which are attenuated more than 20 dB below the permissible value, need not be specified.